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FISHERY INVESTIGATIONS  
ON  
MAGIC RESERVOIR

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## FISHERY INVESTIGATIONS - MAGIC RESERVOIR

by

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During 1959 and 1960, investigations were carried out on Magic Reservoir to determine the condition and composition of the fishery. Personnel who assisted in gathering biological data were Larson, Browne, Coleman and Haycock.

### Physical features

Magic Dam was constructed in 1909, creating a reservoir capacity of 191,500 acre feet. Major tributaries are Camas Creek and Big Wood River, which have a drainage area of approximately 1,600 square miles. The reservoir is about 7 miles in length and 2 miles at the greatest width. Four resorts operate commercially on the reservoir: one at Magic City on the east side, two at Magic Resort on the west side, and one at Hot Springs Landing on the north end.

### Water storage

Minimum water storages from 1929 through 1959 are listed in Table 1. As of July 1, 1960, storage in the reservoir was 111,000 acre feet compared to 124,000 acre feet on July 1, 1959 (13,000 acre feet below 1959). During June 1960, a topographic survey was made to determine the amount of dead storage in the reservoir. Storage figures listed in Table 1 should be corrected accordingly upon completion of the survey report.

It should be noted that the reservoir has not been below 10,000 acre feet since 1934 and has been below 50,000 acre feet only three times in the past 25 years.

Table 1. Minimum water storages in Magic Reservoir from 1929 through 1959.

Year	Acre feet	Year	Acre feet
1929	9,000	1945	103,000
1930	13,000	1946	103,000
1931	7,000	1947	82,000
1932	123,000	1948	84,000
1933	87,000	1949	74,000
1934	3,000	1950	108,000
1935	17,000	1951	117,000
1936	88,000	1952	105,000
1937	37,000	1953	102,000
1938	132,000	1954	81,000
1939	51,000	1955	25,000
1940	82,000	1956	103,000
1941	109,000	1957	86,000
1942	113,000	1958	92,000
1943	134,000	1959	19,000
1944	107,000	1960	400

#### Species composition

Gill net surveys in 1957, 1959, and 1960 indicate that yellow perch are the predominant species (Table 2). However, it is possible that red-side shiners may approach or exceed perch in total numbers in the reservoir. A seine haul made with a 500-foot seine in 1959 contained 67 per cent shiners. Suckers tend to show a decline in numbers since 1957, while perch, chubs, and shiners show an increase.

Table 2. Species composition of gill net collections in Magic Reservoir - 1957, 1959, and 1960

Year	Perch	No/hr	Per cent	Sucker	No/hr	Per cent	Chub	No/hr	Per cent	Shiner	No/hr	Per Cent
May 1957	89	6.8	67.4	42	3.2	31.8	1	0.1	0.8	--	--	0.5
Aug. 1959	307	76.7	90.3	29	7.2	8.5	2	0.5	0.6	--	--	
May 1960	409	14.9	68.4	163	5.9	27.2	22	0.8	3.7	3	0.1	

Year	Trout	No/hr	Per cent	Total hrs	No. of sets
May 1957	--	--	--	13	2
Aug. 1959	2	0.5	0.6	4	4
May 1960	1	0.04	0.7	28	22

Total length measurements were taken on all fish collected in 1960. Perch ranged from 5.0 to 10.2 inches with an average length of 7.1 inches. Suckers ranged from 6.2 to 21.0 inches with an average length of 10.8 inches. Chubs ranged from 8.5 to 13.2 inches with an average length of 9.3 inches.

#### Creel census

Creel census in past years has been only of a spot check nature and may not give a reliable comparison of catch figures. Catch data for the years 1954 through 1960 is presented in Table 3. Total harvest for opening week end, June 4 and 5, 1960, was estimated to be 6,591 trout and 5,397 perch. Despite the fact that perch probably outnumber trout 400 to 1, perch only made up 45 per cent of the combined creel.

Table 3. Combined creel data (boat and bank fishermen) for Magic Reservoir, 1954 - 1960.

<u>Year</u>	<u>Poles</u>	<u>Rb</u>	<u>Rb/pole</u>	<u>Rb/hr</u>	<u>Perch</u>	<u>Perch per pole</u>	<u>Perch per hr.</u>	<u>Total hrs.</u>
1954	180	534	3.0	0.50	421	2.3	0.13	504
1955	219	612	2.8	0.55	460	2.1	0.38	573
1956	152	140	0.9	0.13	54	0.4	0.04	463
1957	289	688	2.4	--	468	1.6	--	--
1958	177	480	2.7	--	258	1.4	--	-
1959	153	184	1.2	--	703	4.6	--	--
1960*	1,597	2,714	1.7	0.45	2,543	1.6	0.41	6,224

\*June 4 - June 26

Tables 4 and 5 show significant differences in catch rates for trout and perch between bank and boat fishermen. The catch per hour for trout from boats was 0.55 while from the bank it was 0.24. Conversely, the catch per hour for perch was 0.10 from boats while from the bank it was 0.94.

If we assume all boat fishermen to be fishing for trout and all bank fishermen to be fishing for perch, we may conclude that approximately 67 per cent of the fishermen are fishing for trout and 33 per cent are fishing for perch (computed from Table 6). However, it should be remembered that the figure for bank fishermen represents the maximum estimate since many bank fishermen do not keep or fish for perch. Boat fishermen catch 84 per cent of the trout taken on the reservoir,

Table 4. Boat creel census data on Magic Reservoir, June 1960.

Date	Boats	Poles	Rb	Rb/pole	Rb/hr	Perch	Perch per pole	Perch per hr	Total hours
6/4	108	284	682	2.4	0.58	128	0.4	0.11	1,176
6/5	152	415	799	1.9	0.47	180	0.4	0.11	1,688
6/11	12	31	79	2.6	0.77	22	0.7	0.21	102
6/12	35	87	273	3.1	0.89	35	0.4	0.11	305
6/18	18	42	87	2.1	0.45	33	0.8	0.17	194
6/19	12	30	54	1.8	0.40	18	0.6	0.13	136
6/21	6	12	41	3.4	0.90	--	--	--	--
6/24	3	7	17	2.4	0.41	--	--	--	--
6/25	2	4	23	5.8	1.35	--	--	--	--
6/26	24	56	109	1.9	0.44	2	0.1	0.01	247
Totals	372	968	2,164	2.2	0.55	418	0.4	0.10	3,953

Table 5. Bank fishermen creel census data on Magic Reservoir, June 1960.

Date	Poles	Rb	Rb/pole	Rb/hr	Perch	Perch per pole	Perch per hr	Total hours
6/4	296	209	0.7	0.21	731	2.5	0.72	1,036
6/5	108	79	0.7	0.19	410	3.8	1.01	408
6/12	65	51	0.8	0.18	433	6.7	1.53	282
6/16	30	60	2.0	0.75	44	1.5	0.55	80
6/18	15	7	0.1	0.01	107	7.1	2.06	52
6/19	38	24	0.6	0.17	146	3.8	1.06	138
6/24	20	5	0.2	0.07	119	5.9	1.78	67
6/26	57	115	2.0	0.54	135	2.4	0.57	209
Totals	629	550	0.9	0.24	2,125	3.4	0.94	2,271

Table 6. Fishermen counts on Magic Reservoir, June 1960.

Date	Boat fishermen*	Bank fishermen	Time
6/4	554	200	0630
6/4	447	255	1030
6/4	216	205	1430
6/4	101	122	1830
6/5	410	120	0630
6/5	425	178	1030
6/5	232	138	1430
6/5	223	79	1830
6/11	94		1200
6/12	242	80	1000
6/26	156	110	1100
6/28	26	15	1200

\*2.6 poles per boat

### Length frequencies

Perch. Total length measurements were taken on 615 perch in fishermen creels during June, 1960. The size range was from 5.0 to 10.8 inches with an average length of 8.1 inches.

Rainbow. Total length measurements were taken on 1,044 rainbow trout in fishermen creels during June 1960. Sizes ranged from 8.5 inches to 23.8 with an average length of 12.4 inches. Scale samples were taken from 28 fish for age and growth analysis (Table 7).

Table 7. Age and growth of rainbow trout collected from creel samples on Magic Reservoir, June 1960.

Age group	Number of fish	Total length at capture	Calculated length at each annulus				
			"Plant"*	1	2	3	4
I	2	10.6	5.4	9.0			
II	15	12.1	4.0	8.2	10.9		
III	9	15.0	3.8	8.0	11.4	14.1	
IV	2	21.5	4.4	10.8	14.4	17.1	19.5
Average			.1	8.4	11.3	14.6	19.5
Increments of growth				4.3	2.9	3.3	4.9
Number of fish			28	28	26	11	2

\*Calculated length of fish upon entering the reservoir. Wild fish in this length group would actually be one year old, whereas hatchery fish would still be in the 0-age group.

On the basis of the scale readings, the length frequencies were separated into the following age groups:



Age class	Length group	Average length	Per cent of creel (1,044 fish)
I	6.5 - 10.0	8.4	2.8
II	10.2 - 13.5	11.3	74.5
III	13.7 - 15.7	14.6	21.9
IV & over	16.0 -	19.5	0.8

During June 1960, only 13 fish in age class IV or over were known to have been taken in the reservoir. Examination of scales shows that fish planted in the reservoir as fingerlings require two full years before they enter the creel.

Average growth of trout the first season in the reservoir is 4.3 inches, 2.9 inches the second season, 3.3 inches the third season, and 4.9 inches the fourth season. By comparison, rainbow in Williams Lake and Mackay Reservoir average 6.5 inches growth the first season, 4 inches the second season, 1.9 and 2.6 inches respectively the third season, and 1.9 and 0.7 inches respectively the fourth season. The drop in growth rate during the second season may indicate that the fish are becoming too large to maintain good growth on a zooplankton diet but are still too small to utilize a fish diet. The sharp increase in growth rate the fourth season suggests a shift in diet from zooplankton to small fish. As in most environments, rainbow trout in Magic do not appear to utilize fish to any extent until they reach 15 or 16 inches in length.

Cursory examination of fish stomachs and food organisms in the reservoir in June 1960, revealed that water fleas or Cladocera (Daphnia pulex) is the primary food organism for age classes I, II, and III.

## Discussion

Yellow perch and red-side shiners appear to be the dominant species in the reservoir. Both species are selective zooplankton feeders and are competing directly with trout in age classes 0 through III throughout the growing season. In addition, perch also actively feed in winter which may account for the low numbers of midge larvae (Tendipedidae) found in bottom samples in June. The slow growth rate of trout in the reservoir the first two growing seasons is undoubtedly related to competition with these dominant populations of perch and shiners.

Specific competition with suckers and chubs is probably of a secondary nature since these species appeared to be utilizing algae and diatomaceous slime for food. However, more extensive study should be made on their food habits.

Only 0.8 per cent of the fish checked in June were over 16 inches in length which would indicate a heavy mortality between age classes III and IV. This, coupled with the fact that it would take two years in the reservoir before "catchable-size" trout (9 - 10 inches) would convert to a fish diet, points up the fallacy of planting catchable-size fish in Magic Reservoir to control other fish species through predation.

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## Proposed plans for an eradication project

Mormon Reservoir. Twin Lakes or Mormon Reservoir lies approximately 27 miles upstream on Camas Creek and to the west of Magic Reservoir. The fish population is nearly all perch along with a few crappies and probably suckers, chubs, and shiners. Further gill net surveys are planned for 1960. Although Mormon Reservoir is not connected with the Magic Reservoir drainage system, several breaks in the outlet canal into Camas Creek during past years are

reportedly the means by which perch were introduced into Magic. Inasmuch as the reservoir receives only light fishing pressure at the present time and poses the greatest potential source of infection of undesirable fish into Magic Reservoir via Camas Creek, it is recommended that it be treated with toxaphene. A topographic survey was completed in June 1960 to determine water volumes. No drainage system will be involved in treatment.

Since the reservoir is very shallow and subject to periodic winterkill, it is recommended that it be replanted, with rainbow and opened to fishing the entire year.

Magic Reservoir drainage. Further population studies will be carried out on the drainage streams to determine how far upstream it will be necessary to go to begin eradication. On Big Wood River, it probably will not be necessary to go beyond Glendale Diversion, approximately 16 stream miles. Additional tributary streams will add about 5 or 6 miles. Camas Creek and tributaries will amount to about 52 stream miles for treatment. Much of the drainage will be dry by fall.

Magic Reservoir. Due to the large numbers of trout and perch which are present in the reservoir, it is recommended that rotenone be used if the actual water volume treated is below 10,000 acre feet. Rotenone is faster acting and will allow maximum salvage of fish by the public. For volumes over 10,000 acre feet, it is recommended that toxaphene be used for economy.

Fish salvage. Much public concern has been expressed over the possibilities of salvaging trout alive from the reservoir and the river below the dam. Further investigation is planned to determine the feasibility of seining fish from isolated holes in the river below the dam. Test hauls should also be made in September during low water to determine if any salvage is possible in the reservoir.

Cost of eradication program. Treatment of the drainage with emulsifiable rotenone will require an estimated 135 gallons at a cost of \$540. Treatment of the reservoir with powdered rotenone at 1.0 ppm would cost about \$1.00 per acre foot of water; treatment with toxaphene at 0.05 ppm would cost about \$0.07 per acre foot of water. Labor costs with toxaphene would be considerably less.